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A SYSTEMATIC REVIEW ON THE KEY ELEMENTS OF SUSTAINABLE CAMPUS INITIATIVES IN HIGHER EDUCATION INSTITUTIONS

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Abstract

Higher Education Institutions (HEIs) play a crucial role in shaping intellectual development across social, economic, and environmental dimensions towards achieving the Sustainable Development Goals (SDGs). HEIs have undertaken significant initiatives to incorporate sustainability into their operational practices, and the implementation of sustainable campuses has become an increasingly important area of focus. HEIs are responsible for promoting sustainability through their operational practices while also educating future generations. However, the absence of effective sustainable campus initiatives poses a significant challenge to the ongoing pursuit of SDGs in HEIs. There remains a clear absence of key elements required to fully realise the goals of sustainability within these institutions. Hence, this study aims to identify the key elements of sustainable campus initiatives in HEIs. The systematic review approach was adopted in this study, where relevant articles were retrieved from the Scopus and Web of Science databases for analysis. The systematic review examined 902 articles from Scopus and Web of Science databases within the timeframe from 2015 to 2025. Inclusion, exclusion, and quality criteria were applied to ensure that only high-quality and relevant articles were selected. Ultimately, 34 relevant papers were identified for inclusion in this systematic review approach. The analysis revealed six key elements essential for the successful implementation of sustainable campus initiatives, including governance and leadership, strategic planning, operation, curriculum development, research and development, and community engagement. These findings underscore the importance of all six elements in achieving the successful implementation of sustainable campuses in HEIs.

Keywords: Higher Education Institutions, Initiatives, Key Elements, Sustainable Campus

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INTRODUCTION

In recent years, Higher Education Institutions (HEIs) can foster a culture of sustainability through the implementation of sustainable campus initiatives (HEIs) to reduce environmental impacts. According to Badea et al. (2020), the effectiveness of these initiatives has been questioned, particularly regarding how HEIs integrate sustainability into their academic curricula to achieve United Nations Sustainable Development Goals (SDGs). The involvement of various stakeholders is often linked to the effectiveness of these initiatives, as they drive the implementation of these sustainable efforts. As a leader of this transformation towards sustainability, HEIs play a crucial role in shaping future generations to promote the action of sustainability. There are three dimensions of sustainability that underpin HEIs' sustainable practices, strategies, and policy implementation. As stated by Abad-Segura and González-Zamar (2021), these three dimensions are social, environmental and economic. HEIs, as influential societal entities which serve as hubs for creation and dissemination of knowledge, are responsible for encouraging sustainable practices in their campus operations to inspire wider societal change (Goni et al., 2017). The urgent need to address environmental issues has accelerated the implementation of sustainable practices across sectors, including HEIs (Filho et al., 2019). HEIs are very committed to addressing environmental challenges and fostering a culture of sustainability by focusing on Goal 4 of the SDGs, which is equitable and quality education. However, the absence of key elements within sustainable campus initiatives leads to inefficient resource management, rising operational expenses, and escalating waste, thereby hindering the nation's capacity to meet its SDG commitments. Thus, it is imperative to identify comprehensive sustainable campus initiatives for higher education institutions to achieve the desired sustainable outcomes.

LITERATURE REVIEW

Overview of Sustainability in Higher Education

Sustainability and green initiatives both aim to reduce environmental impacts but differ in terms of scope and focus. As outlined in the Brundtland Report, sustainability encompasses not only environmental practices but also social and economic dimensions in order to balance the use of resources with the preservation of ecological and social equity (Mahanayak, 2024). In contrast, green initiatives concentrate solely on environmental practices. Even though both concepts share the same goal in protecting the environment, the distinction between these concepts has often resulted in fragmented implementation strategies within Higher Education Institutions (HEIs), where environmental actions may be prioritised while social and economic aspects receive less attention (Syam et al., 2023).

In recent years, as noted by Din et al. (2021), the SDGs have become a main priority across various sectors, including HEIs, where many institutions have transformed into crucial players to become leaders in integrating sustainable practices. To achieve the SDGs, sustainable practices must be delivered across the economic, social and environmental dimensions (Abad-Segura & González-Zamar, 2021). HEIs not only demonstrate environmental responsibility by embedding sustainability into their frameworks but also serve as educational models, fostering a culture of sustainability and advancing global SDGs (Dawodu et al., 2022).

Despite the increasing emphasis on sustainability in higher education, existing literature largely focuses on the promotion and outcomes of sustainability initiatives, while comparatively less attention has been given to the institutional barriers that hinder their effective implementation. Studies have shown that universities often face structural, financial, and organisational challenges when attempting to operationalise sustainability strategies (Filho et al., 2019; Ribeiro et al., 2021). These limitations create a gap between sustainability commitments and the practical implementation of sustainable campus initiatives.

Furthermore, much of the existing research tends to treat HEIs as a homogeneous group, with limited discussion on how sustainability practices may differ across geographical and institutional contexts. Universities in developed countries often possess stronger financial capacity, advanced infrastructure, and institutional support for sustainability initiatives compared to those in developing regions. Consequently, the strategies and priorities for implementing sustainability initiatives may vary significantly depending on institutional size, funding availability, and national policy environments. This indicates the need for greater contextual understanding when examining sustainable campus initiatives, particularly in developing countries such as Malaysia where resource limitations may influence implementation strategies.

Key Dimension of Sustainable Campus Initiatives

Higher Education Institutions (HEIs) are pivotal in advancing sustainability by incorporating environmental, social and economic dimensions into their operations. These interconnected aspects often demand collaborative approaches, such as addressing financial challenges to support environmental upgrades or driving social change to adopt sustainable practices. HEIs focus on reducing ecological footprints, promoting sustainability education and engaging communities in ways that align with the SDGs (Gomez & Yin, 2019). Key initiatives include lowering carbon emissions, enhancing energy efficiency, and managing waste responsibly. Universities globally have adopted renewable energy solutions such as solar panels and wind turbines, alongside recycling

programmes and waste audits, to minimise environmental harm (Ribeiro et al., 2021; Abdulghaffar & Williams, 2021). Water conservation measures, like rainwater harvesting, and pollution prevention strategies, such as carbon pricing and plastic reduction programmes, further support these goals (Lee & Lee, 2021). Additionally, biodiversity projects, like green space integration, highlight HEIs' commitment to environmental stewardship. By seeking collaborations and understanding the needs of local communities, HEIs can strengthen their role in promoting sustainability and contribute to the broader implementation of the SDGs.

However, the implementation of environmental sustainability initiatives in HEIs is frequently constrained by several practical barriers. One of the most significant challenges is financial limitation, as many sustainability projects such as renewable energy infrastructure or green building retrofits require substantial initial investment. Limited institutional budgets and competing priorities may delay or restrict the adoption of such initiatives (Ribeiro et al., 2021). These challenges are often more pronounced in universities located in developing countries or in smaller institutions where financial resources and technical expertise may be limited.

The social dimension of sustainable campus initiatives emphasises well-being, inclusion, and community participation. Universities are actively promoting sustainability education and encouraging student involvement in green initiatives (Lee & Lee, 2021). Activities focusing on eco-friendly food alternatives, stress management programmes, and secure living environments aim to improve health and well-being. Furthermore, HEIs' sustainable strategies in promoting social justice can be achieved through equitable access to resources and the integration of gender and cultural diversity (Filho et al., 2019). These efforts highlight the role of universities in fostering a culture of sustainability, promoting equity, and engaging communities in achieving the SDGs.

Nevertheless, social sustainability initiatives may encounter resistance to change among stakeholders, including faculty members, administrative staff, and students. Resistance often arises from limited awareness, insufficient training, or perceptions that sustainability initiatives increase workloads without immediate benefits. In addition, the effectiveness of such initiatives may differ across institutions depending on organisational culture, leadership commitment, and available institutional support. Larger universities may possess greater capacity to institutionalise sustainability programmes, whereas smaller institutions may rely more heavily on individual initiatives or external collaborations.

The third dimension, which is the economic, focuses on reducing costs through the efficiency of resources, sustainable investments, and green economy practices. HEIs that invest in renewable energy can reduce their long-term

operational costs and enhance their economic resilience (Lee & Lee, 2021). Additionally, through sustainable procurement practices, cost-effectiveness can be further improved by purchasing renewable-certified energy and eco-friendly products. Similarly to the public-private partnerships, sustainability programmes and waste recycling initiatives can also generate funds for HEIs. These initiatives not only strengthen economic resilience but also support the broader implementation of the SDGs.

Despite these potential economic benefits, the transition towards sustainable campus initiatives often faces governance and policy-related barriers. Many HEIs lack clear sustainability policies, dedicated funding mechanisms, or integrated governance structures to coordinate sustainability efforts effectively. These challenges are particularly evident in developing countries where institutional priorities may focus more heavily on academic expansion and infrastructure development rather than sustainability transformation.

Therefore, there remains a significant research gap in understanding how sustainability initiatives are implemented across diverse institutional and geographical contexts. In particular, limited studies have examined how key sustainability elements operate within resource-constrained environments such as Malaysian HEIs. Investigating these contextual differences is important to identify practical strategies that align with institutional capacities and regional realities. Hence, by examining these key dimensions, this study contributes to the growing discussion on sustainable campuses by exploring how sustainability initiatives can be effectively implemented within the context of HEIs while addressing financial, organisational, and contextual challenges.

RESEARCH METHODOLOGY

This research employs a systematic review approach to retrieve and screen the literature in order to identify the key elements of sustainable campus initiatives in HEIs. To fulfil the aim of this research, a comprehensive literature review was conducted using the Scopus and Web of Science databases, focusing on key elements of sustainable campus initiatives in HEIs on a global scale. The databases are among the largest peer-reviewed collections available. This methodological approach has increasingly contributed to the review of scientific knowledge in recent years (Abad-Segura et al., 2020). Articles were identified using the search query in Table 1 [TITLE-ABS-KEY (elements) AND TITLE-ABS-KEY (sustainable) AND TITLE-ABS-KEY (campus) AND TITLE-ABS-KEY (initiatives) AND TITLE-ABS-KEY (higher education)], covering the period from 2015 to 2025.

Table 1: Terms used in the search engine.

Headline Search
elements AND sustainable AND campus AND initiative AND (higher AND education)

The process of selecting articles for systematic review was undertaken through a systematic three-stage approach, as illustrated in Figure 1.

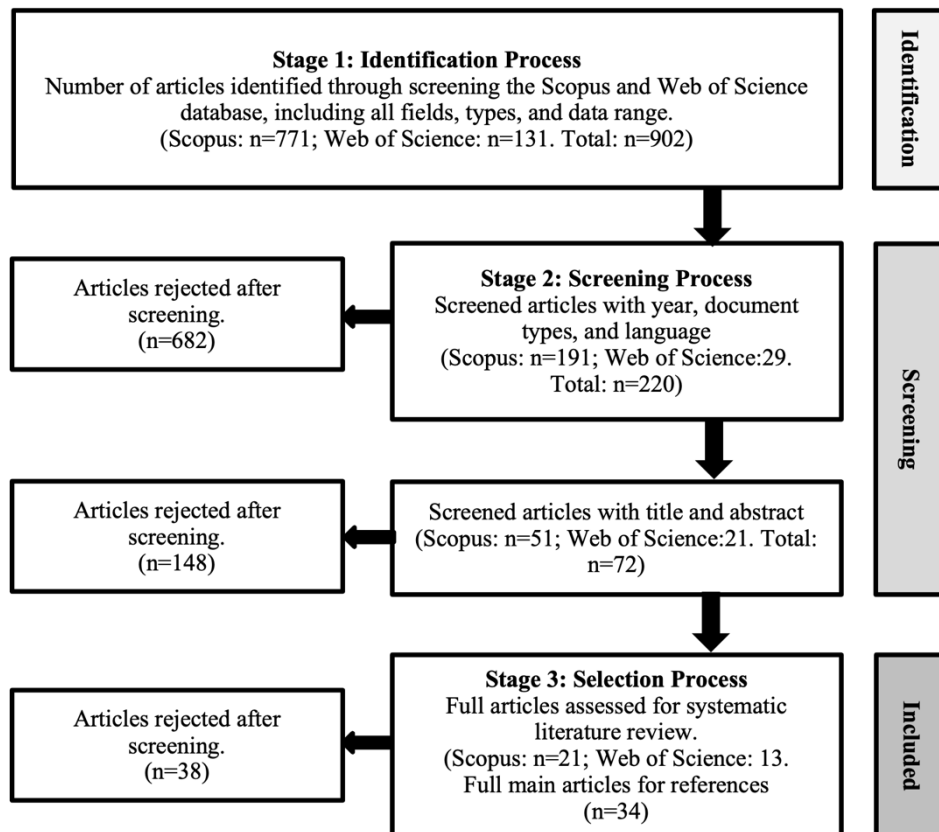


Figure 1: Process selection of articles for systematic review

In the identification stage, a comprehensive screening was performed to identify potentially relevant articles across two major databases, which are Scopus and Web of Science. The search considered all fields, document types, and the data range, resulting in a total of 902 articles, with Scopus (n = 771) and Web of Science (n = 131). Following this, a second stage, which is screening, identified articles based on a detailed screening process. In the screening stage, articles were further refined based on specific criteria such as publication year, document type, and language. This stage narrowed the selection to 220 articles for further analysis, with Scopus (n = 191) and Web of Science (n = 29). A total of 682 articles were excluded at this stage as they failed to meet the predetermined criteria or lacked relevance to the study. Subsequently, the remaining articles

were screened based on their titles and abstracts, which reduced the number of articles to 72, with Scopus (n = 51) and Web of Science (n = 21). At this step, 148 articles were rejected as they did not meet the inclusion criteria. Finally, in the selection stage, after successfully passing the screening phases, the full texts of the remaining articles were thoroughly assessed to determine their suitability for inclusion in the systematic literature review. Following this detailed selection, 34 articles were selected, with articles from Scopus (n=21) and Web of Science (n=13). This final stage ensured a refined and well-considered compilation of articles that would contribute effectively to the intended research aims. The remaining 38 articles were excluded due to insufficient relevance to the inclusion criteria.

Literature Inclusion and Exclusion Criteria

The selection of relevant and high-quality articles for this systematic review was guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework proposed by Moher et al. (2009), where inclusion and exclusion criteria were designed. The PRISMA framework also guided the literature search and selection process to ensure methodological transparency and reproducibility. Articles were included if they were published from 2015 onwards, written in the English language, and aligned with the research aim of identifying the key elements of sustainable campus initiatives in HEIs. To enhance the feasibility of the study, a rigorous screening process was applied, especially excluding articles not written in the English language to avoid difficulties in the full reading and analysis process. Then, articles were screened based on title, abstract, and keywords following the initial filtering to determine eligibility. The final inclusion focused on the key elements of sustainable campus initiatives in HEIs were included, while several articles were excluded for not meeting the specific inclusion criteria. Ultimately, 34 articles in this study were chosen, as they met the inclusion criteria and were selected for data extraction and analysis. To further strengthen the transparency of the review process, a quality assessment was conducted on the selected articles to evaluate their methodological relevance to the research objectives. The quality assessment focused on several criteria, including (1) clarity of research objectives, (2) appropriateness of research methodology, (3) reliability of data sources, (4) relevance to sustainable campus initiatives in HEIs, and (5) the clarity of findings and discussion. Each article was assessed independently by the research team based on these criteria to ensure that only studies with sufficient methodological quality and relevance were included in the final synthesis. To ensure reliability, the selection process was conducted by three researchers. This systematic and transparent process ensured that only the most relevant and high-quality articles were selected in the review.

Screening of Studies

The screening process was conducted systematically to ensure the inclusion of relevant and high-quality articles. The process started with the manual removal of duplicate articles to enhance the efficiency and accuracy. The screening was then conducted in two phases. First, the titles and abstracts of all identified articles were reviewed by three researchers to assess their eligibility based on the predefined selection criteria. Only articles that aligned with the research aim were retained. Any disagreements among the researchers during this phase were resolved through discussion, with the third author acting as a mediator when necessary to reach a consensus. Next, to confirm the suitability of the selected articles, the full text of the articles was screened by the three researchers. This phase involved a detailed evaluation based on the following requirements: published from 2015 onwards, articles must be written in the English language and focused on the key elements of sustainable campus initiatives in HEIs to ensure they meet the inclusion criteria. Articles unrelated to these areas of study were excluded. During the full-text screening stage, the quality assessment criteria were also applied to ensure that the selected articles demonstrated sufficient methodological rigor and provided meaningful contributions to the topic. Articles that lacked clear research methods, insufficient empirical evidence, or weak analytical discussion were excluded from the final selection. The manual screening process allowed for thorough and transparent decision-making among the researchers. This collaborative approach ensured a unified selection process, which led to the inclusion of the most relevant and high-quality articles for the systematic review.

Data Extraction and Synthesis

To ensure the reliability and accuracy of the systematic review, the data extraction and synthesis process was conducted in this methodology. The first author played a significant role in conducting the initial data extraction, while the second author cross-checked the extracted data. The third author verified the consistency and correctness of the data extraction before the final decision. There are several categories for data extraction, which are characteristics of the systematic review, area of study, methods, results, and discussions. In addition, information related to the methodological quality and research design of each study was documented during the extraction process to support the quality assessment of the included articles. The extracted data were organised in tabular form to synthesise the findings. This tabular format facilitated the identification of patterns, trends, and gaps in the literature, enabling the authors to address the key elements effectively. Findings were summarised, and results were compared across studies during this synthesis process. This rigorous and collaborative approach ensured the

reliability and validity of the data extraction, which was essential for answering the research aim.

ANALYSIS AND DISCUSSION

Table 2: Number of selected articles and their year of publication.

Year of Publication	Scopus	WOS
2025	-	-
2024	7	4
2023	1	4
2022	1	3
2021	3	1
2020	3	-
2019	1	-
2018	1	1
2017	-	1
2016	1	1
2015	1	-
Total Manuscripts	34	

Table 2 displays the number of selected articles and their year of publication from 2015 to 2025, with a total of 34 articles included. Notably, no articles were selected from 2025. The data shows an inconsistent trend in the number of articles selected from both databases, Scopus and Web of Science (WOS). In 2024, there are seven articles chosen from Scopus and four articles from WOS, while fewer articles were selected from 2015 until 2019. Most articles chosen for analysis were from the Scopus database, with a total amount of 19 out of 34 articles. There is increasing concern in this research topic in recent years, with Scopus emerging as the dominant source of relevant literature. This distribution highlights the variability in research output over the years and underscores the absence of publications from 2025, which may reflect the time lag in academic publishing or the unavailability of relevant studies for the current year. The data underscores the importance of focusing on contemporary studies while also considering foundational works from earlier years to provide a comprehensive understanding of the topic.

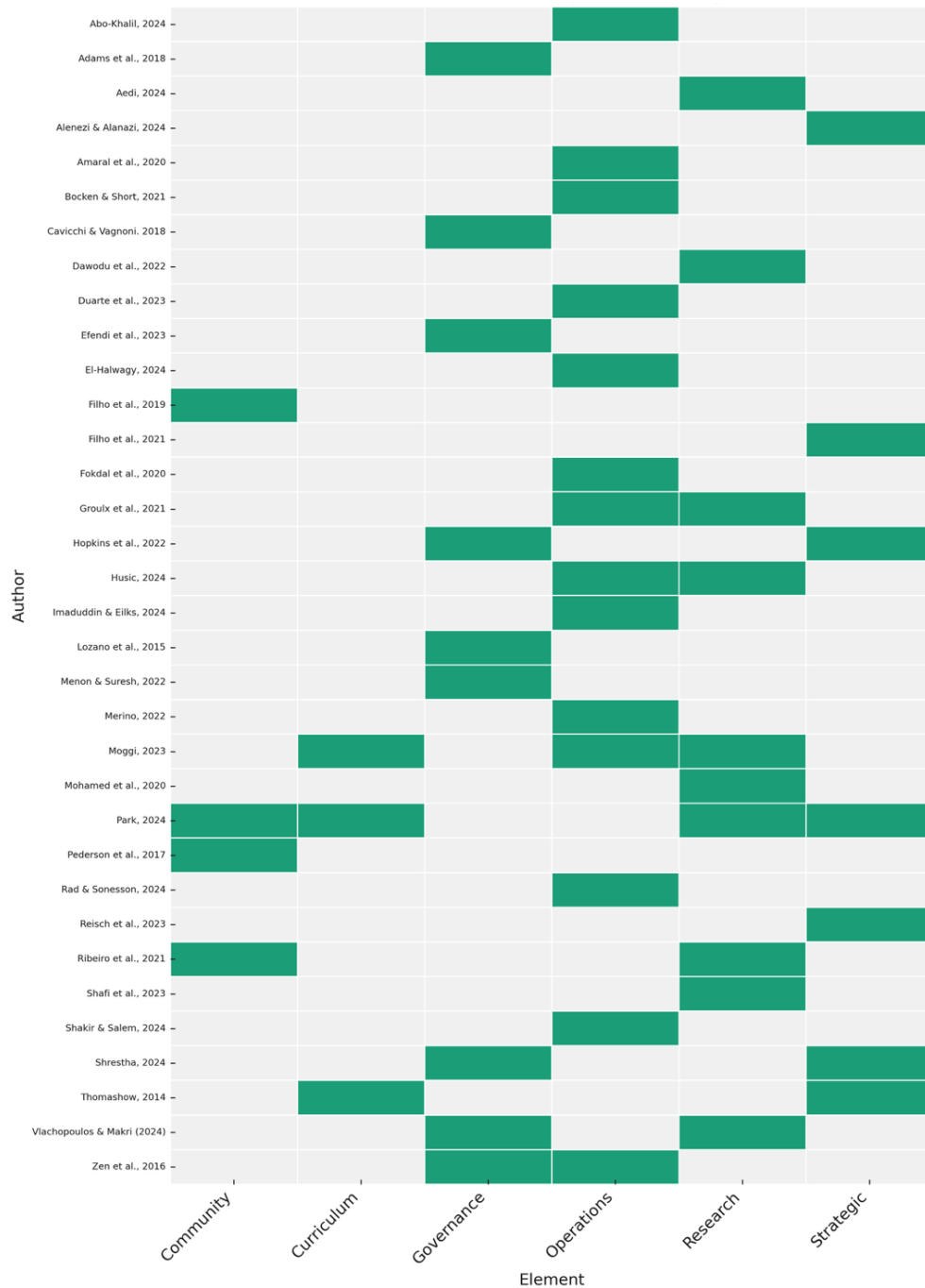


Figure 2: Tile Plot of Sustainable Campus Elements by Author

The tile plot in Figure 2 highlights the approach required to encourage sustainability within HEIs and provides a comprehensive overview of the key elements of sustainable campus initiatives as identified in previous studies. There are six key elements identified from previous studies, which are governance and leadership, strategic planning, campus operations, curriculum development, research and development, and community engagement. All these elements are interconnected and collectively contribute to the effective practices of sustainability in HEIs. Each element plays a distinct yet complementary role in advancing environmental stewardship, social responsibility, and economic resilience.

Governance and Leadership emerge as foundational elements, emphasising the importance of strong leadership and effective governance structures in driving sustainability initiatives. Studies such as those by Efendi et al. (2023) and Shrestha (2024) underscore the need for leaders to articulate a clear vision for sustainability, address cultural and socioeconomic barriers, and foster collaboration with stakeholders. Effective governance ensures that SDGs are integrated into institutional policies and practices, enabling HEIs to align with global sustainability frameworks. Leadership development programmes that emphasise Environmental, Social, and Governance (ESG) principles are critical for cultivating a culture of sustainability and ensuring long-term commitment (Zafar et al., 2024).

Strategic Planning is another critical element, as it provides a roadmap for integrating sustainability into campus operations and academic programmes. Reisch et al. (2023) and Park (2024) highlight the importance of developing strategic maps that align the SDGs with operational performance. This involves adopting participatory methodologies, engaging stakeholders in decision-making processes, and establishing comprehensive policies that define sustainability objectives. Strategic planning ensures that sustainability initiatives are not isolated efforts but embedded within the institutional framework, fostering a holistic approach to environmental, social, and economic sustainability.

Campus Operations represents the practical implementation of sustainability initiatives, focusing on reducing environmental impact and enhancing resource efficiency. Amaral et al. (2020) identify four dimensions of sustainable campus operations, including energy management, waste reduction, water conservation, and sustainable transportation. These initiatives are essential for addressing climate change and promoting resource efficiency. For instance, renewable energy systems, green building designs, and waste-to-energy programmes not only reduce operational costs but also contribute to environmental conservation. However, the applicability of these dimensions may vary across regions, necessitating tailored approaches suited to local contexts, such as those in Malaysian HEIs.

Curriculum Development is pivotal in equipping students with the knowledge and skills needed to address sustainability challenges. Integrating sustainability principles into academic programmes fosters interdisciplinary collaboration and experiential learning, empowering students to become "change agents" for sustainability (Park, 2024; Husic, 2024). Strong institutional policies and leadership are essential for the successful implementation of sustainability curricula, ensuring that sustainability topics are embedded across all disciplines and not limited to specific majors. This approach nurtures environmentally conscious leaders who are equipped to drive sustainable development in their respective fields.

Research and Development plays a crucial role in advancing sustainability initiatives by fostering innovation and generating knowledge. Collaborative research projects, interdisciplinary studies, and initiatives such as the "Campus as a Living Laboratory" provide students with hands-on learning experiences and contribute to the development of comprehensive solutions to sustainability challenges (Pilon et al., 2020). Hosting seminars, workshops, and conferences further enhances institutional visibility and promotes a culture of sustainability by disseminating best practices and fostering collaboration among researchers, students, and industry experts (Aedi, 2024; Ribeiro et al., 2021).

Community Engagement is the final key element, emphasising the importance of collaboration with local communities and student involvement in sustainability initiatives. Engaging students as active participants fosters a sense of responsibility and proactivity, enhancing their commitment to sustainable practices (Ribeiro et al., 2021). High-impact practices such as service learning and community engagement allow students to apply sustainability concepts in real-world contexts, reinforcing their role as future leaders in sustainable development (Husic, 2024). Collaborating with local communities also ensures that sustainability initiatives are inclusive and address the needs of diverse stakeholders, fostering a sense of shared responsibility (Efendi et al., 2023). Beyond community outreach activities, stakeholder engagement also plays a critical role in strengthening the research and development (R&D) element of sustainable campus initiatives. Universities increasingly integrate students, academic staff, and local communities into sustainability-oriented research and innovation processes. Students can contribute through project-based learning, research assistantships, and participation in interdisciplinary sustainability research projects. Academic staff contribute by leading research initiatives that address real-world sustainability challenges, while collaboration with local communities and external stakeholders provides practical insights, local knowledge, and opportunities for pilot testing innovative sustainability solutions. Such collaborative engagement not only enhances the relevance and applicability of sustainability research but also promotes knowledge co-creation between

universities and society. For example, partnerships with local communities can support research on waste management, renewable energy adoption, or sustainable urban development, allowing campuses to function as living laboratories for sustainability innovation. Through these participatory approaches, HEIs can strengthen both their research capacity and their societal impact in advancing sustainable development goals.

In conclusion, the six key elements identified in Table 3 represent effective practices for implementing sustainable campus initiatives in HEIs. While each element addresses specific aspects of sustainability, their integration is essential for achieving holistic and impactful outcomes. However, challenges such as financial constraints, cultural resistance, and the lack of robust governance structures remain significant barriers. To overcome these challenges, HEIs must prioritise strategic planning, invest in leadership development, and adopt tailored approaches that consider local contexts. By addressing these key elements, HEIs can serve as models of sustainability, driving transformative change and contributing to the global agenda for a more sustainable future.

CONCLUSION

In conclusion, this systematic review has identified six key elements essential for the successful implementation of sustainable campus initiatives in HEIs, including governance and leadership, strategic planning, campus operations, curriculum development, research and development, and community engagement. These elements collectively form a comprehensive framework that enables HEIs to address environmental, social, and economic challenges while fostering a culture of sustainability. The findings underscore the critical role of HEIs as leaders in promoting sustainable development, not only through operational practices but also by educating future generations and engaging with communities. However, challenges such as financial constraints, cultural resistance, and the absence of robust governance structures remain significant barriers to the effective adoption of these initiatives. To overcome these challenges, HEIs must prioritise strategic planning, invest in leadership development, and foster interdisciplinary collaboration. Furthermore, integrating sustainability into curricula and research, alongside active community engagement, will ensure that HEIs contribute meaningfully to global SDGs. This study highlights the need for tailored approaches that consider local contexts, particularly in regions like Malaysia, to ensure the relevance and effectiveness of sustainable campus initiatives. By addressing these key elements, HEIs can serve as models of sustainability, driving transformative change and advancing the global agenda for a more sustainable future.

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DISCLOSURE STATEMENT

All authors have significantly contributed to this research. Author 1 managed the writing, methodology, and data analysis; Author 2 reviewed, edited, and finalised the paper; and Authors 3 and 4 wrote the literature review. This paper is original, unpublished, and not under consideration elsewhere. All authors approve the final manuscript.

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